Mathematical Formulae

Compound Interest

$$\text{Total amount} = P\left(1 + \frac{r}{100}\right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2}ab\sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2}r^2\theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f}\right)^2}$$

2

Section A (62 marks)

Answer **all** the questions in this section.

1   Calculate

(a) $\left(\dfrac{2}{3}\right)^{-2} + \sqrt[3]{7\dfrac{1}{3}}$,

Answer   ....   [1]

(b) $\dfrac{7.53 - 3.25}{2 + 4.3} - 2.71^{\frac{3}{4}}$.

Answer   ....   [1]

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2   The table below records the score when a fair die is tossed 25 times.

Score	1	2	3	4	5	6
Frequency	5	3	4	6	4	3

(a)   Calculate the mean score.

Answer   ....   [1]

(b)   If these results were represented by a pie chart, calculate the angle for the sector representing a score of 4.

Answer   ....°   [2]

3   Written as the product of its prime factors, $2520 = 2^3 \times 3^2 \times 5 \times 7$.

(a)   Write 2160 as the product of its prime factors. Show your working clearly.

Answer .... [2]

(b)   (i)   Find the highest common factor (HCF) of 2160 and 2520.

Answer .... [1]

(ii)   Find the smallest positive integer of k such that $2520k$ is a perfect square.

Answer $k = $ .... [1]

[Turn over

4　**(a)**　Simplify $\dfrac{3x}{4} - \dfrac{2x+1}{5}$.

Answer .... [2]

(b)　Simplify $\dfrac{7x^6}{2} \div \dfrac{49x^3}{10}$.

Answer .... [2]

5 Ali has a fair coin and an ordinary fair 6-sided die.
He tosses the coin and throws the die.
If he gets a tail and a three, he records the outcome as (T, 3).

(a) List all Ali's possible outcomes.

Answer

[2]

(b) Find the probability that Ali gets

(i) a head and a number more than 2,

Answer .... [1]

(ii) a tail and a prime number.

Answer .... [1]

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6 (a) The quantities *a* and *b* are in the ratio 8 : 6.
The quantities *b* and *c* are in the ratio 9 : 3.
Write the ratio *a* : *b* : *c* in its simplest form.

Answer .... : .... : .... [2]

(b) (i) Solve the inequality $5x \le 26$.

Answer .... [1]

(ii) Write down the largest integer value *x*, satisfying $5x \le 26$.

Answer *x* = ... [1]

[Turn over

7 **(a)** Write the following numbers in standard form.

    (i) 203000

Answer .... [1]

    (ii) 0.0001894

Answer .... [1]

(b) $(5.3 \times 10^a) \times (2.5 \times 10^b) = k \times 10^n$, where $1 \leq k < 10$.
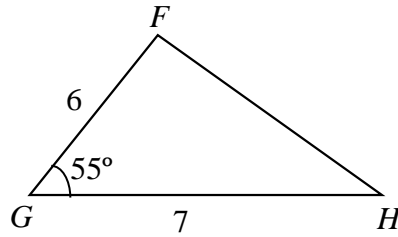
    (i) Find the value of k.

Answer $k = $ .... [1]

    (ii) Write down an expression for n in terms of a and b.

Answer $n = $ .... [1]

8 **(a)**

In triangle *FGH*, *FG* = 6 cm, *GH* = 7 cm and angle *FGH* = 55º.
Calculate the length of *FH*.

Answer   *FH* = ... cm   [3]

(b)
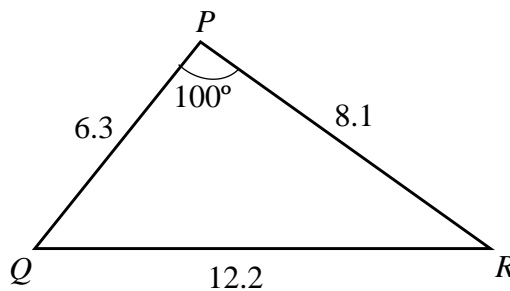
The diagram shows a triangle *PQR*.
PQ = 6.3 cm, *PR* = 8.1 cm, *QR* = 12.2 cm and angle *QPR* = 100º.
Calculate angle *PQR*.

Answer   Angle *PQR* = ... º   [3]

[Turn over

9   **(a)**   This year, Mr Cheng earns $12 420.
        This is 3.5% more than he earned last year.
        Calculate the amount Mr Cheng earned last year.

Answer $ ....   [2]

(b)   John deposited $1000 in a bank. At the end of 2 years, he received an interest
        of $50. Calculate the rate of simple interest given by the bank.

Answer   .... %   [2]

(c)   Sam deposited $25 000 in a bank which pays out 3.7% compound interest per
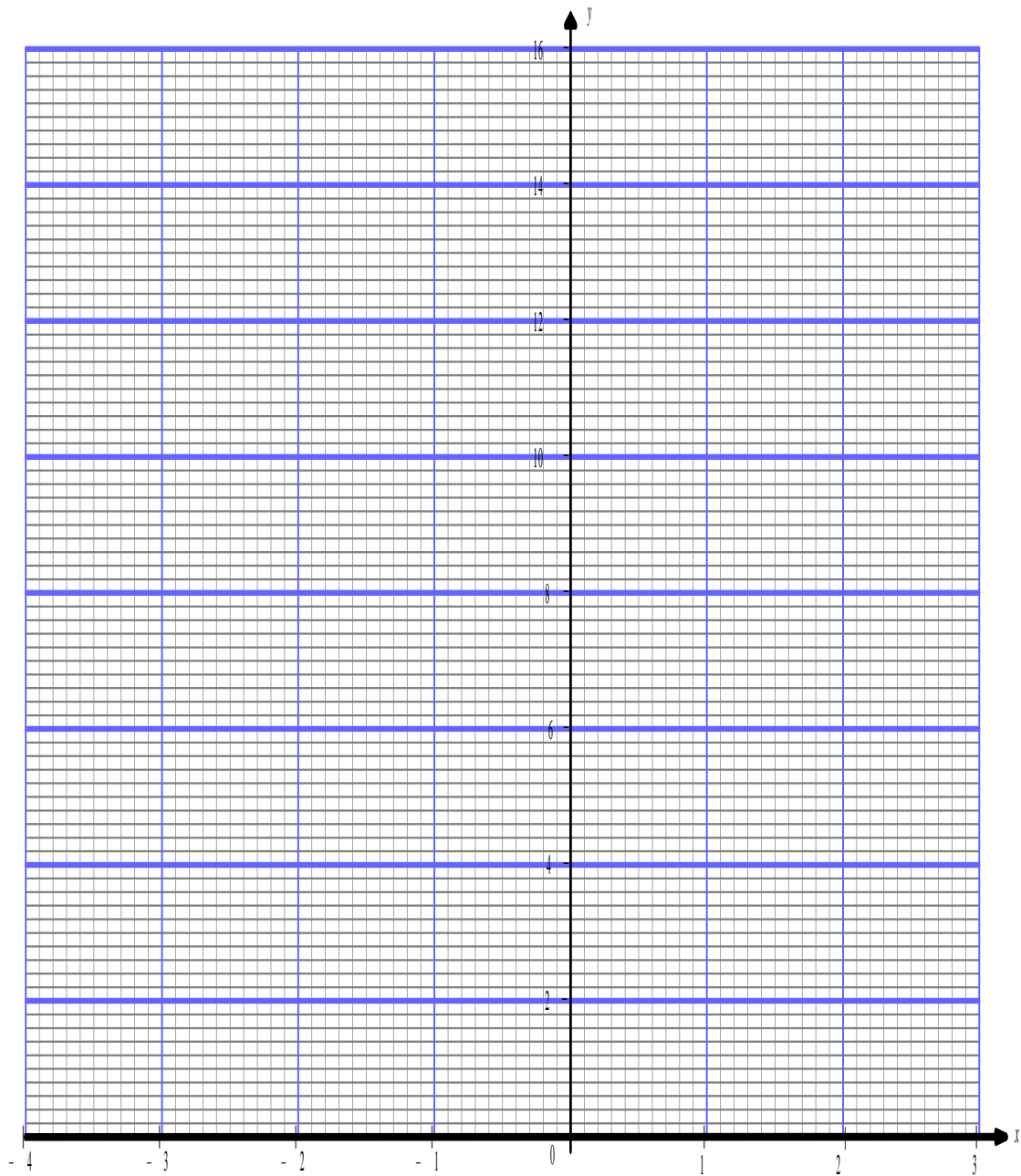   annum. Calculate the interest he will receive after 5 years.

Answer $ .... [2]

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10 The table of values below is for the curve $y = x^2 + x + 4$.

x	-4	-3	-2	-1	0	1	2	3
y	16	10	6	p	4	6	10	16

(a) Find the value of p.

Answer $p =$ .... [1]

(b) On the grid, draw the graph of $y = x^2 + x + 4$ for $-4 \le x \le 3$.

[2]

[Turn over

(c) Use your graph to find

    (i) the coordinates of the minimum point,

                                             Answer (....................... , ...) [1]

    (ii) the value of y when $x = -2.5$.

                                             Answer $y = $ .... [1]

(d) By drawing a tangent, find the gradient of the curve $y = x^2 + x + 4$ when $x = 1$.

                                             Answer .... [2]

11
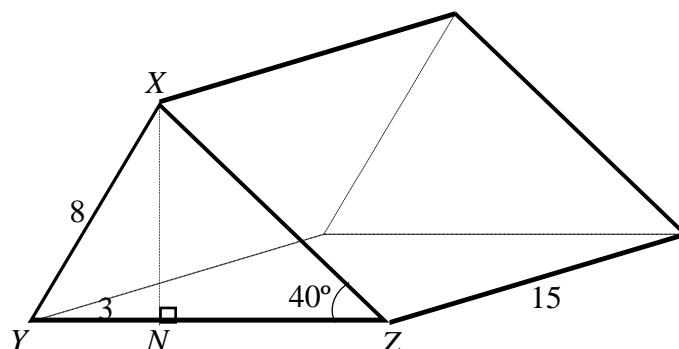
Triangle *XYZ* is the cross-section of a prism.
XY = 8 cm, *YN* = 3 cm and the length of the prism is 15 cm.
Angle *XZN* = 40° and angle *XNZ* = 90°.

(a) Show that the perpendicular height, *XN*, of the triangle is 7.42 cm, correct to 3 significant figures.

Answer
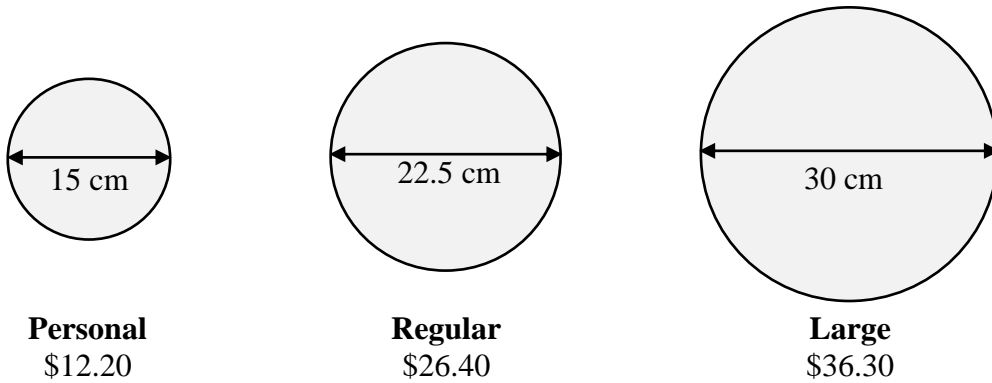
[2]

(b) Find the length of *NZ*.

Answer   *NZ* = ... cm   [2]

(c) Calculate the area of the triangle *XYZ*.

Answer   .... cm^2 [2]

(d) Find the volume of the prism.

[Turn over

Answer .... cm^3 [2]

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12 A pizza company sells pizzas in 3 sizes, with the prices and diameters as shown.

Personal	**Regular**	**Large**
15 cm	22.5 cm	30 cm
$12.20	$26.40	$36.30

Assume thickness of each pizza to be consistent for all sizes.

(a) Show that the area of a regular pizza is 398 cm^2, correct to 3 significant figures.

Answer

[1]

(b) John and David wanted to order one personal and one regular pizzas.
The waitress stated that getting the large pizza is a better deal.
Is the waitress correct? Show your calculations.

Answer ....*Answer*...

.... [5]

(c) Ahmad wants to hold a party and orders from this pizza company.
He needs the total area of the pizzas to be at least that of 10 regular pizzas.
He refers to some of the promotion items shown below.

| Combo *A*	Combo *B*
2 personal pizzas for $22	2 large pizzas for $66

Ahmad can only choose either Combo *A* or Combo *B*.
By calculating the total amount he will spend on each combo, determine
which combo he should choose.

[Turn over

Answer Ahmad should choose Combo .... because .... [4]

Section B (8 marks)

Answer **one** question from this section. Each question carries 8 marks.

13 The speeds, in km/h, of 100 cars travelling along road *A* were measured.
The results are shown in the cumulative frequency graph.
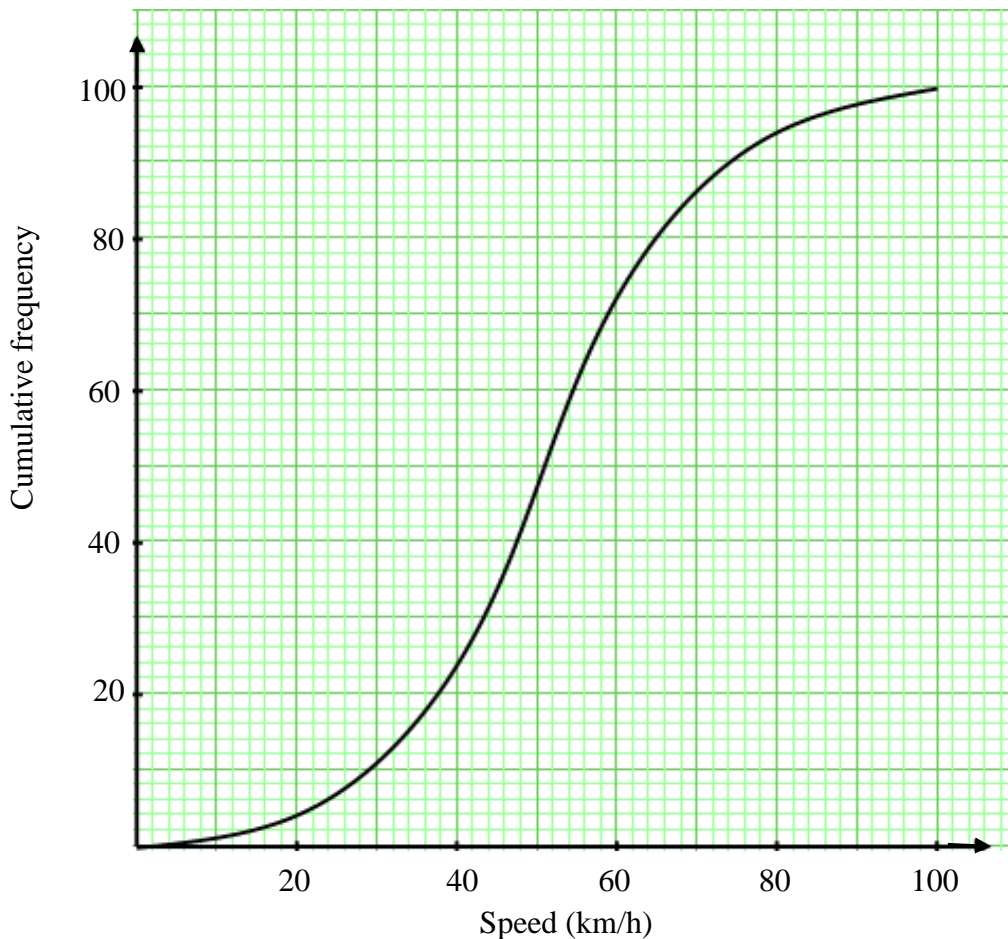
(a) Use the graph to find
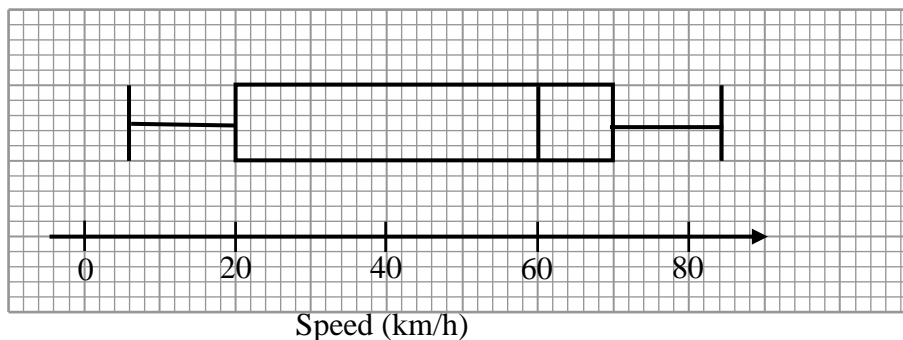
(i) the median speed,

Answer .... km/h   [1]

(ii) the inter quartile range,

Answer .... km/h   [1]

(iii) the number of cars that were travelling faster than 80 km/h.

0

Answer .... cars [2]

(b) The speeds, in km/h, of 100 cars travelling along road *B* were recorded using a box-and-whiskers plot.

Speed (km/h)

(i) On which road did the cars travel faster?
Give a reason for your answer.

Road .... [1]

Reason: ....

(ii) On which road did the drivers drive more consistently?
Give a reason for your answer

Drivers on road ..…….. drive more consistently.

Reason: .... [1]

(c) In a class of 40 students, 8 of the students were left-handed.
Two of the students were chosen at random.
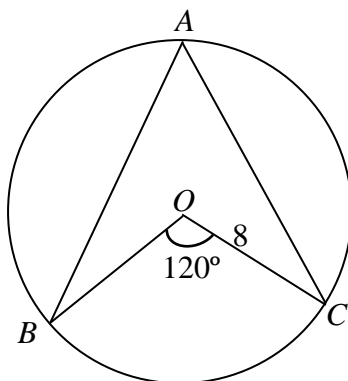Find the probability that both students chosen were left-handed.

Answer .... [2]

[Turn over

14 **(a)** The perimeter of a square is equal to the circumference of a circle of radius 5 cm. Find the length of the side of the square.

Answer .... cm   [2]

(b) Another square has the same area as a circle with radius r cm.
The length of the side of this square is l cm.
Find l in terms of r and π.

Answer $l =$ .... [2]

(c)

A, B and C are points on a circle centre O with radius of 8 cm.

Angle $BOC = 120°$.

(i) Calculate angle BAC.

Answer Angle $BAC =$ .... °   [1]

(ii) Calculate the perimeter of the **major** sector $OBAC$.
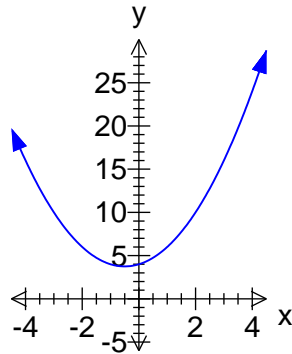
Answer .... cm [3]

End of Paper

[Turn over

Answer Key

1	a	4.19
	b	-1.43
2	a	3.4
	b	86.4
3	a	$2^4 \times 3^3 \times 5$
	bi	360
	bii	70
4	a	$(7x- 4) / 20$
	b	$5x^3 / 7$
5	a	(H1) (H2) (H3) (H4) (H5) (H6) (T1) (T2) (T3) (T4) (T5) (T6)
	bi	1/3
	bii	1/4
6	a	4:3:1
	bi	$x \le 5.2$
	bii	5
7	ai	2.03×10^5
	aii	1.894×10^{-4}
	bi	k= 1.325
	c	n = a+b+1
8	a	6.07
	b	40.8

9	a	12 000
	b	2.5
	c	4980.15
10	a	4
	b	
	ci	(-0.5, 3.75)
	ii	7.6-7.75
	d	2.8-3.2
11	a	7.42 (shown)
	b	8.84
	c	43.9
	d	658
12	a	398(shown)
	b	Waitress is correct. The large pizza cost less and they will get more.
	c	B. It is cheaper
13	ai	71
	ii	30
	b	82
	ci	A . median speed is higher
	ii	A. ts IQR is smaller
	d	7/195
14	a	7.85 [7.86]
	b	$l = \sqrt{(\pi r^2)}$
	ci	60
	ii	49.5